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(54) **A protective helmet and a method of manufacturing a part included therein**

(57) The disclosure relates to an outer shell (1) for a protective helmet and a method of manufacturing it. In order to be able to manufacture a helmet which has undercut form and which well surrounds the head of the wearer, by injection moulding in as simple a plastic manufacturing tool as possible, the outer shell (1) consists of a plurality of sections (3, 4, 5) which are interconnected with one another via connecting portions (6, 7) the neck and side sections (4, 5) are located, on manufacture, in positions where the helmet shell has no undercut form and, after manufacture, are bent in along the connecting portions (6, 7) for the outer shell (1) to assume its final form. It is also possible to bend the sections (4, 5) proper after the manufacture. The result will be a helmet with at least one undercut area, and grooves (8, 9) and grooves (8, 9) between the sections (3, 4, 5).

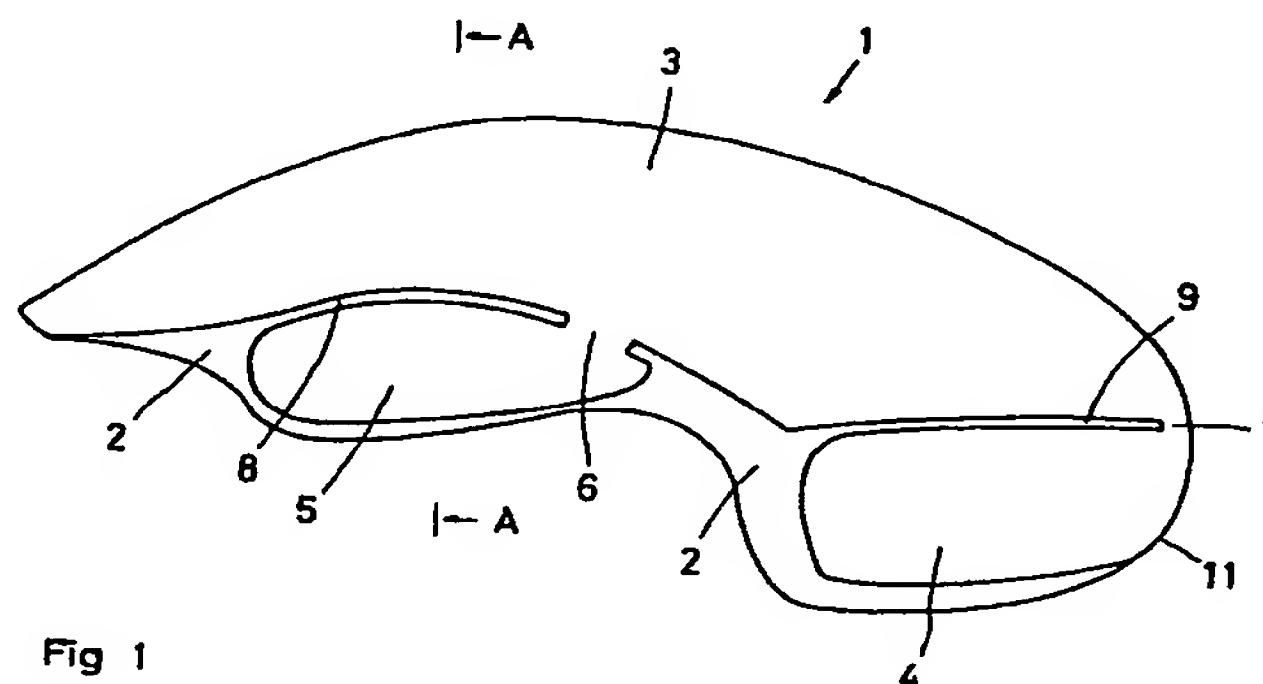


Fig 1

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## Description

### TECHNICAL FIELD

The present invention relates to a protective helmet, for example a bicycle helmet, which comprises a outer shell of relatively hard material, an inner shell, fixedly secured interiorly in the outer shell and manufactured from an energy-absorbing and, in comparison with the material of the outer shell, a considerably softer material, as well as a belt set for securing the helmet on the user's head.

The present invention also relates to a method of manufacturing an outer shell for a protective helmet, for example a bicycle helmet.

### BACKGROUND ART

Bicycle helmets are known in numerous various designs and constructions and, in recent times, it has become increasingly common that bicycles helmets have a relatively hard outer shell and, in relation thereto, a considerably softer inner shell of energy-absorbing material. In this instance, the purpose of the outer shell is to distribute the load against a relatively large surface area of the inner shell, to prevent the helmet from breaking into small pieces if, in powerful impact, the inner shell were to crack, and finally to prevent sharp objects from penetrating right through the helmet.

For the outer shell to have its intended function, it is vital that it covers the greater part of the outer surface of the inner shell. In such instance, problems arise in that the outer contour of the helmet is, as a rule, undercut in such a manner that, for example, a neck portion of the helmet is arched inwards and downwards in under the neck of the wearer's head in a corresponding manner, the front side portions of the helmet may converge on the outside in a downward direction.

An outer shell for a bicycle helmet with this configuration is difficult to manufacture, since the outer shell will not have the requisite release capability in the tool in which it is manufactured. The alternative will therefore be an extremely complex and expensive tool for manufacturing the outer shell.

### PROBLEM STRUCTURE

The present invention has for its object to design the protective helmet intimated by way of introduction such that the drawback inherent in the prior art technology are obviated. In particular, the present invention has for its object to form the protective helmet such that the outer shell may be manufactured in a simple and economical tool even though its final form is complicated and includes undercut features.

The present invention also has for its object to realise a method of manufacturing the outer shell.

## SOLUTION

The objects forming the basis of the present invention will be attained in respect of the protective helmet if this is characterized in that the outer shell has a number of sections where closely adjacent sections are interconnected to one another via connecting portions.

The objects forming the basis of the present invention will be attained in respect of the method if this is characterized in that the outer shell, on manufacture, is given a number of mutually contiguous sections.

Further advantages will be attained according to the present invention if the protective helmet is given one or more of the characterizing features as set forth in appended Claims 2 to 11 and if the method is given one or more of the characterizing features as set forth in appended Claims 12 and 14.

### BRIEF DESCRIPTION OF THE ACCOMPANYING DRAWINGS

The present invention will now be described in greater detail hereinbelow, with particular reference to the accompanying Drawings. In the accompanying Drawings:

Fig. 1 is a straight side elevation of a protective helmet according to the present invention, and

Fig. 2 is a partial cross section through the helmet, taken along the section marking A-A in Fig. 1.

### DESCRIPTION OF PREFERRED EMBODIMENT

The protective helmet, for example a bicycle helmet, shown in Fig. 1 has a helmet shell with an outer shell 1 and an inner shell 2. The outer shell is manufactured from a relatively hard but nevertheless slightly flexible material, for example a plastic material. On the other hand, the inner shell 2 is manufactured from an energy-absorbing material which is considerably softer than the material in the outer shell. As examples of materials in the inner shell, mention might be made of various types of cellular plastic. Such materials display poor mechanical strength and readily crack in the event of, for example, impact loading.

The outer shell 1 is divided into a number of mutually contiguous sections, in the embodiment shown on the Drawings, an upper head section 3, a neck section 4 and two side sections 5. The side sections are located on each side of the helmet at a front, lower side portion thereof, approximately in the region of the temples of the wearer. Closely adjacent sections are interconnected to one another by means of connecting portions 6 and 7 which are somewhat flexible. In the final form of the helmet, closely adjacent sections have narrow, slot or groove-shaped interspaces 8 and 9.

The term and concept of undercutting will be employed below and can, in this context, be illustrated in Fig. 2 in that, in the finished state of the helmet, the distance between the lower edge of the side section 5 to the centre line 10 of the helmet is less than the distance between the upper edge of the side section 5 and the centre line 10.

Manufacture of the helmet in the illustrated embodiment may be put into effect without difficulty despite the fact that the outer shell 1 is undercut. This is because, on removal of the outer shell 1 from the tool in which it is manufactured, the undercut sections 4 and 5 will be pivoted away by flexing the connecting portions 7 and 6 respectively. However, this requires that the female part of the tool is divisible, since otherwise neither the male part of the tool nor the outer shell would be capable of being removed.

However, manufacture of the outer shell takes place in a form deviating from the final form, in which both of the side sections 5 are directed out from one another so that the above-mentioned undercuts do not occur. As a result, the requirement of a divisible female part in the tool is eliminated. Correspondingly, the neck section 4 is manufactured in a form deviating from its final form in which the neck section is directed outwards, i.e. rearwards, from the interior of the outer shell. As regards the degree of outward inclination of the side sections 5 and the neck section 4, it is sufficient if this is high enough for the undercutting of the outer shell 1 to be eliminated. However, it is suitable to have a greater outward inclination such that the insides of the side and neck sections are turned to face downwards or even partly outwards. This latter alternative implies that a pivot  $<90^\circ$ , suitably in the range of between  $120^\circ$  and  $170^\circ$  is employed to cause the side and neck sections to assume their final positions in the outer shell. Such a pivoting takes place with the connecting portions 6 and 7 as joint portions.

When the insides of the side and neck portions 5 and 4 are turned to face outwards in the manufacturing process, it is also possible to apply to them (possibly manufacture in one piece with them) e.g. anchorage fittings for a belt set which the protective helmet is to carry in its finished state.

After the manufacture of the outer shell, the sections are brought to their final positions which, in the embodiment shown on the Drawings, entails that the side sections 5 are pivoted or bent towards one another by bending of the connecting portions 6, and that the neck section 4 is bent in a clockwise direction by bending of the connecting portion 7. This applies in both alternatives, since residual deformations often remain in the connecting portions. They should be manufactured in a divisible tool in positions which coincide with or approximate the final positions.

## DESCRIPTION OF ALTERNATIVE EMBODIMENTS

In the foregoing, the outer shell has been described

as manufactured in one piece. Possibly, practical applications are conceivable in which the outer shell is manufactured in two or more parts, which may then individually be sectionally divided.

Further, the outer shell may be given a different sectional division than that described above. For example, solutions are conceivable in which the neck section 4 is divided into two rear, lower side sections. Possibly, solutions are also conceivable in which the upper head section is divided into a front section and a rear section.

Further modifications of the present invention are possible without departing from the scope of the appended Claims.

## Claims

1. A protective helmet, for example a bicycle helmet, which comprises an outer shell (1) of relatively hard material, an inner shell (2), fixedly secured interiorly in the outer shell and manufactured from an energy-absorbing and, in comparison with the material of the outer shell, a considerably softer material, as well as a belt set for securing the helmet on the user's head, **characterized in that** the outer shell (1) has a number of sections (3, 4) where closely adjacent sections are interconnected with one another via connecting portions (6, 7).
2. The protective helmet as claimed in Claim 1, **characterized in that** the final form of the outer shell (1) is realised by bending of at least one of the connecting portions (6, 7).
3. The protective helmet as claimed in Claim 1 or 2, **characterized in that** the final form of the outer shell (1) is realised by bending of at least one of the sections (3, 4, 5).
4. The protective helmet as claimed in any of Claims 1 to 3, **characterized in that** the outer shell (1) has a head section (3) which is in the form of a calotte which covers an upper head portion of the helmet, and a neck section (4) which covers the neck portion of the helmet and which, together with the head section (3), defines a space which is partly undercut at least in the longitudinal direction of the helmet.
5. The protective helmet as claimed in Claim 4, **characterized in that** the neck section (4) is manufactured in a position where its inside relative to the head section (3) is turned to face at least partly downwards.
6. The protective helmet as claimed in any of Claims 1 to 5, **characterized in that** the outer shell (1) has a head section (3) which is in the form of a calotte which covers an upper head portion of the helmet,

and two opposing side section (5) which cover the forward/lower side portions of the helmet and which, together with the head section, define a space which is at least partly undercut in the transverse direction of the helmet.

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7. The protective helmet as claimed in Claim 6, **characterized in that** the side sections (5) are manufactured in positions where their insides relative to the head section (3) are turned to face at least partly downwards. 10
8. The protective helmet as claimed in any of Claims 4 to 7, **characterized in that** the connecting portion (7) of the neck section (4) is located symmetrically at the rearmost portion of the helmet. 15
9. The protective helmet as claimed in any of Claims 4 to 8, **characterized in that** the connecting portions (6) of the side sections (5) are located at the rear portions of the side sections. 20
10. The protective helmet as claimed in any of Claims 1 to 9, **characterized in that**, in the final form of the outer shell (1), the interspaces (8, 9) between adjacent sections (3, 4, 5) are gap- or groove-shaped. 25
11. The protective helmet as claimed in Claim 10, **characterized in that** the extent of the connecting portions (6, 7) counting in the longitudinal direction of the interspaces (8, 9) which separate adjacent sections (3, 4, 5) is slight. 30
12. A method of manufacturing an outer shell (1) for a protective helmet, for example a bicycle helmet, **characterized in that** the outer shell (1) is, on manufacture, given a number of mutually contiguous sections (3, 4, 5). 35
13. The method as claimed in Claim 12, **characterized in that** the outer shell (1), on manufacture, is given a form which is not undercut; and that the outer shell, after manufacture, is given a final form with at least one undercut portion. 40
14. The method as claimed in Claim 12 or 13, **characterized in that** adjacent sections (3, 4, 5) are, on manufacture, interconnected via connecting portions (6, 7). 45

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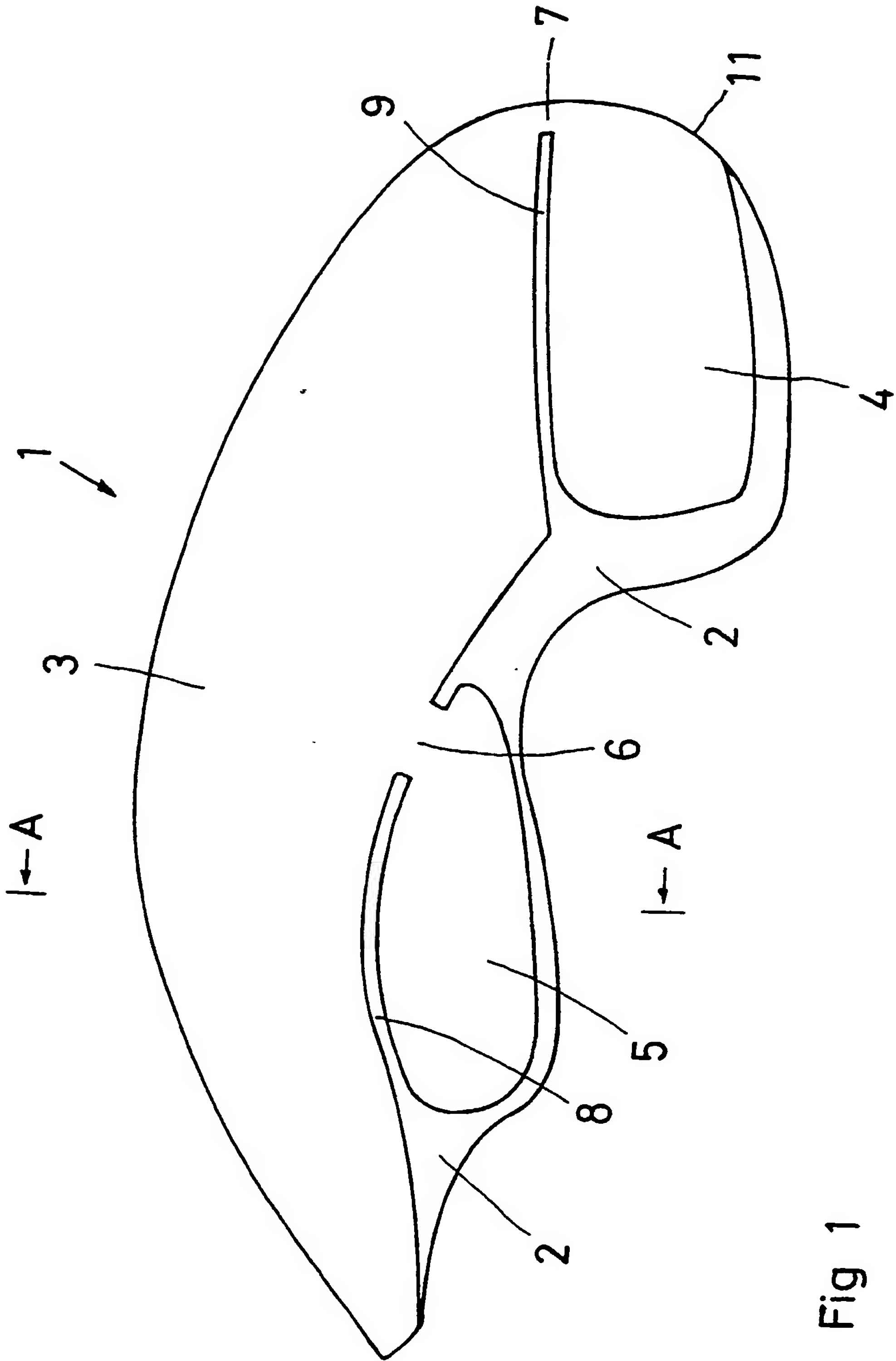


Fig 1

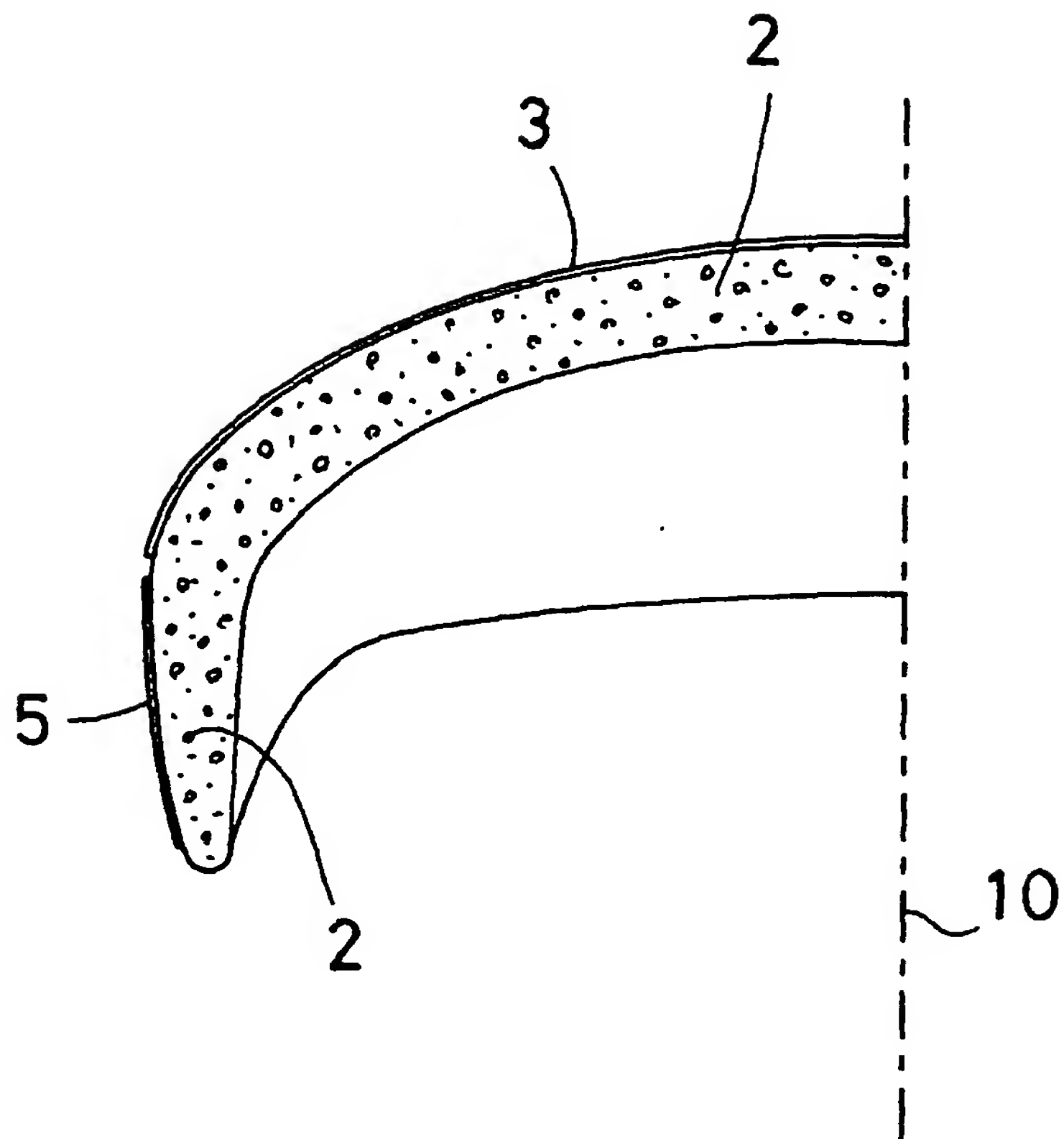


Fig 2



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# EUROPEAN SEARCH REPORT

Application Number  
EP 98 85 0110.2

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.6)
X	US 5012533 A (D. RAFFLER), 7 May 1991 (07.05.91) --	1-14	A42B 3/06 A63B 71/10
A	EP 0280042 A1 (RÖMER GMBH), 31 August 1988 (31.08.88) --	1-14	
A	US 3943571 A (M.C. BOATMAN), 16 March 1976 (16.03.76) --	1-14	
A	SE 452412 B (CCM INC.), 30 November 1987 (30.11.87) --	1-14	
P,X	CH 689008 A5 (R. PELLEGRINI), 31 July 1998 (31.07.98) -----	1-14	TECHNICAL FIELDS SEARCHED (Int. Cl.6) A42B A63B
The present search report has been drawn up for all claims			
Place of search STOCKHOLM		Date of completion of the search 26 October 1998	Examiner BÄCKNERT CHRISTER
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